

ADDRESSING REMOTE DATA OBJECTS VIA A COMPUTER NETWORK

This invention relates to data processing systems. More particularly, this invention relates to the addressing of remote data objects, such as, for example, internet web pages, via 5 a computer network, such as, for example, the internet.

It is known to provide addresses for data objects upon the internet using URL 10 addresses that are constructed of alphanumeric character sequences and are unique to a particular data object. The format of this addressing structure functionally specifies a protocol, a server and a resource path on that server.

The widespread adoption of the internet with this URL addressing format has the result that the introduction of any new or alternative addressing structure faces considerable 15 entry barriers as the existing addressing infrastructure is already so well established.

15 The existing URL addressing structure was developed at a time when the overwhelming majority of devices employed by users to access the internet were personal computers or workstations having a full alphanumeric keyboard. Advances in the use of the internet have lead to the development of different types of device for accessing the internet. A 20 rapidly expanding field of access device is that of mobile telephones. Small personal digital assistants are also becoming increasingly common as internet access devices.

These new internet accessing devices typically do not have a full alphanumeric 25 keyboard to enable the ready input of alphanumeric URL addresses. In the case of mobile telephones the numeric keypad may be used to enter letters as well as numbers with multiple letters being assigned to each key and multiple presses required on each key to select the letter required. Whilst this does provide an input mechanism for alphanumeric addresses, it is slow, inconvenient and cumbersome in use. An alternative approach that has been employed is to display an image of an alphanumeric keyboard on a touch sensitive display screen and allow 30 the user to "type" with a stylus upon the keys of this displayed keyboard in order to enter letters. The small size of the displays associated with many devices and the lack of tactile feedback associated with this approach makes accurate and rapid entry of alphanumeric addresses difficult.

Viewed from one aspect the present invention provides a method of determining a price associated with a secondary address to be used as an alias for a primary address identifying a remote data object on a computer network, said method comprising the step of:
using a length algorithm whereby shorter secondary addresses are associated with
5 higher prices.

The present invention provides a system of secondary addresses to be used as aliases for primary addresses and determines a price to be associated with the secondary address on the basis of the length of the secondary address. When establishing a secondary addressing 10 scheme to be superimposed upon a primary scheme, the present invention recognises that short, and consequently generally easier to remember and use, secondary addresses will be highly sought after and accordingly establishes a pricing structure that reflects this. This is quite different from the standard flat rate URL pricing structure whereby domain name prices are independent of the length or other characteristics of those domain names, at least at the 15 level of first registration.

A further level of sophistication that may be given to such a non-flat rate pricing scheme for secondary addresses is the use of a relevance algorithm whereby secondary addresses determined to have a pre-existing relevance to users are associated with higher 20 prices. This mechanism allows "famous" numbers to have corresponding higher prices to reflect their commercial worth.

A further factor that may influence the pricing of a secondary address is the duration of its use, such that use for a longer duration is associated with a higher cost. In this way, 25 short term use of a secondary address may be accommodated with a reduced price.

It will be appreciated that the secondary addresses and the primary addresses could take many different forms. However, in preferred embodiments of the invention the secondary address is a numeric address which is concatenated with an alphanumeric prefix to 30 form an internet URL address. The common address prefix may be the URL of a mapping server that operates to map the secondary addresses to the primary addresses. The remote data objects being accessed are typically internet web pages.

Viewed from another aspect the invention provides apparatus for determining a price associated with a secondary address to be used as an alias for a primary address identifying a remote data object on a computer network, said apparatus comprising:

length pricing logic using a length algorithm whereby shorter secondary addresses are
5 associated with higher prices.

Viewed from a further aspect the invention provides a computer program product
storing a computer program for controlling operation of a computer to determine a price
associated with a secondary address to be used as an alias for a primary address identifying a
10 data object on a computer network, said apparatus comprising:

length pricing code using a length algorithm whereby shorter secondary addresses are
associated with higher prices.

15 Embodiments of the invention will now be described, by way of example only, with
reference to the accompanying drawings in which:

Figure 1 schematically illustrates a computer network with different types of user
access devices for accessing a remote data object;

20 Figure 2 is a flow diagram illustrating the mapping of a secondary address to a
primary address;

Figure 3 is a diagram representing the data that may be stored within a remote server
for performing the mapping between the secondary address and the primary address;

25 Figure 4 is a flow diagram illustrating the manner in which the price for registration of
a secondary address may be determined;

Figures 5, 6 and 7 illustrate the different way in which the suffix length, relevance and
30 duration of use may influence the price;

Figure 8 schematically illustrates a general purpose computer of the type that may be
used to implement the above described technique; and

Figure 9 is a diagram illustrating the exchange of messages that may occur when accessing a remote data object using the technique of one embodiment of the present invention.

5 Figure 1 illustrates a plurality of computers connected via the internet to form a computer network. A conventional PC 2 is one user access device. A mobile telephone 4 is illustrated as a further user access device. The remote data object in the form of an internet web page is stored upon a web site server 6. A remote server 8 that performs a mapping from a secondary address to a primary address is also provided.

10 A user of the personal computer 2 will enter an alphanumeric URL address using the keyboard associated with the personal computer 2. This URL address uniquely identifies the target page upon the web site server. A domain name server (not illustrated) used by the PC 2 will map the alphanumeric address to a purely numeric IP address that will be used by the 15 underlying internet infrastructure. It is not intended that a user would typically specify a remote data object by typing in a specific IP address for that data object.

20 When the user of the mobile telephone 4 wishes to access the same internet web page, they do this by pressing a short cut key 10 on the mobile telephone that specifies an alphanumeric prefix 12 that forms part of a secondary address. They then press the numeric keypad keys of the mobile telephone 4 to specify a numeric suffix 14 of the secondary address. This complete secondary address is then used to access the internet. The 25 alphanumeric prefix 12 is the address of the remote database server 8 and accordingly the access request from the mobile telephone 4 is routed to the remote database server 8. The remote database server 8 uses the numeric suffix 14 to index into a database of mappings between numeric suffixes and primary addresses. In the example illustrated, the numeric suffix "911" maps to the primary address "WEBSITE.COM".

30 The remote database server 8 uses the mapping data it has looked up to redirect the access request received from the mobile telephone 4 to the web site server 6 and including the information that the request originated from the mobile telephone 4. The web site server 6 responds to this forwarded request from the remote database server 8 substantially in the same manner as if it had originated directly from the mobile telephone 4. The web site server 6 may include a transcoding unit 16 that recognises the access device as a mobile telephone and

accordingly adapts the web page returned to the mobile telephone 4 into a form more suited for display upon that device. Further interaction, such as activating hypertext links on web pages or activating buttons on web pages, takes place directly between the mobile telephone 4 and the web site server 6 without requiring further intervention by the remote database server
5 8. The remote database server 8 only needs to be involved at those points at which a user would normally type a full alphanumeric URL address for a web page when seeking to access that web page.

In addition to the input by the user of a secondary address further additional inputs
10 may be input from the user device 2 or 4 and sent via the internet to the remote data base server 8. These inputs may comprise any of the following: the location of the user, the type of device being used, the time of the user input, demographic data of the user, which may be pre-registered on the user device or may be stored with an accessible third party, the operator and/or network the user is coming through, a language the user has specified, cell identity if
15 the user device is a mobile, other location identifier, such as one provided by GPS, function of user identity presented by the user device, geographic location of the WAP gateway, voice gateway or ISP (internet service provider) used to access the net, and the capabilities of the device (for example, Java or not).

20 In some embodiments a plurality of primary addresses may be associated with a single secondary address on the remote database server, the actual one of the plurality of primary addresses that is accessed by the remote database server depending upon one or more of the additional inputs. Alternatively, some or all of the additional inputs may be passed directly to the owner of the content stored at the primary address. The owner of the content can then
25 vary the behaviour of the content according to these additional inputs. For example, the language of the data shown, its data type or format may be changed, depending, for example, on the native language of the user or the capabilities of the user device. This may be done dynamically or by redirection to a static location.

30 A further possibility is to provide the remote database server with a control means whereby a user accessing the server can be made to pass through a further step before accessing the remote data unit, in certain circumstances. For example, if the system is a secure system then the remote database server 8 may request the input of access credentials, such as a password prior to allowing access to the remote data unit. Alternatively, if the user

is due to receive a bill, then the system can transmit a bill to the user prior to accessing the remote data unit. Other uses of the additional step could be the display of interstitial advertising and sponsorship, or if the user were accessing the server via a mobile phone 10 then the data access could be redirected to a voice call, if it were necessary to contact the user 5 for a particular reason.

Figure 2 is a flow diagram illustrating the processes discussed in relation to Figure 1. At step 18, a user presses the shortcut key 10 to specify the alphanumeric prefix "www.bango.net". At step 20, the user then uses the numeric keypad to specify a desired 10 numeric suffix for the web page they are seeking to access. Web page providers may advertise and publish the numeric suffixes associated with the secondary addresses for their web pages in a similar way to which publicity is currently given to the full alphanumeric addresses. Providers of the mobile telephones 4 may also seek to educate users regarding what are commonly used numeric suffixes as use of the invention makes use of mobile 15 internet devices easier and accordingly promotes these mobile devices in general.

At step 22, a check is made as to whether or not the specified numeric suffix is one for which the mapping to the primary address is already held within a local cache within the mobile telephone. The local cache may be provided as a browser plug-in. The browser plug-in can activate when the browser is started to check, as a background task, the currency of its 20 cached information with the remote database server 8.

If the local cache does contain the mapping sought, then processing proceeds from step 22 to step 24 at which this mapping is carried out and to step 26 at which the primary 25 address is issued directly from the mobile telephone 4 to the web site server 6. Processing then proceeds to step 28 at which the user continues to interact directly with the web site server 6.

If the result of the test at step 22 was that the desired mapping was not locally cached, 30 then processing proceeds to step 30 at which the secondary address comprising the alphanumeric prefix 12 identifying the remote database server 8 concatenated with the numeric suffix 14 is issued from the mobile telephone 4 and accesses the remote database server 8. At step 32, the remote database server 8 receives the request routed to it and uses the numeric portion to index a lookup table to find a particular primary address. At step 34, the

remote database server 8 forwards the request received from the mobile telephone 4 onto the web site server 6 using the primary address of the web site server 6.

The web site server 6 receives the request forwarded to it by the remote database server 8 and responds to this directly to the mobile telephone user 4 at step 36. When the mobile telephone 4 receives the response from the web site server 6, this will contain the primary address of the web site server 6 and accordingly the local cache within the mobile telephone 4 may be updated at step 38. After step 38, processing proceeds to step 28 and the user of the mobile telephone 4 interacts with the web site server 6 directly in the normal way.

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Figure 3 illustrates various examples of the data that may be held within the remote database server 8 mapping numeric suffixes to primary addresses. As will be seen, short and readily remembered numeric suffixes may be registered and paid for by large well known corporations. Numeric suffixes having well known associations and relevance to users, e.g. "007", may be allocated and associated with related primary addresses in a highly beneficial way. A small local shop may seek to use its telephone number as its numeric suffix. The use of telephone numbers as a numeric suffix is highly advantageous as these are in many cases well known to the users and already promoted by the organisations concerned. This is one way in which the need to inform and educate users as to the numeric suffixes to use for a particular web site may be simplified.

The remote database server also provides a service for content owners who do not at present own internet domains or other web sites. It is possible in this situation to buy a number in the same way as other customers and additionally to purchase storage space associated with this number. The content which may include a voice service, motion video data or text information may then be stored in the storage space on the remote database and an incoming request specifying the content owner's number is directed to this content. Thus, the information is transmitted to the user without being re-routed to another internet location. The number is mapped to a URL in the storage space of the remote database and the content is returned to the user.

Content stored on the remote database server 8 in this way may be updated and modified by the authorised owner through a variety of interfaces, including: on-line forms, http connection, OTA (Over The Air) interface or a telephone connection. For example, a

common OTA interface method is SMS (short messaging service) from wireless devices. The content owner accesses their content from their wireless device, the system automatically recognising the incoming caller id.

5 Figure 4 is a flow diagram illustrating the way in which a mapping between a numeric suffix and a primary address may be established. At step 40, a user wishing to register a particular numeric suffix enters that into a web page hosted by the remote database server 8. At step 42, the user also enters the desired duration of use (period of hire) of the specified numeric suffix.

10 At step 44, the remote database server 8 looks up the numeric suffix specified at step 40 and determines as step 46 whether or not it is available for use, i.e. whether it has already been registered by someone else. If the specified suffix is not available for use, then processing proceeds to step 48 at which an appropriate message is returned to the user and the 15 registration process terminates.

If the test at step 46 indicates that the numeric suffix is available for use, then processing proceeds to step 50 at which a determination using an algorithm that calculates price in dependence upon the length of the suffix is used to establish a possible price for the 20 registration. At step 52, an algorithm is applied to the suffix being registered that determines whether or not that suffix has any known pre-existing relevance to users. As an example, the operator of the remote database server 8 may establish that suffixes such as "007" have an enhanced value by virtue of their well known association with a fictional character. Another 25 number such as "911" may have an enhanced value due its association with a particular well known product, such as a sports car. Further, numbers such as "123" may have an enhanced value due to being considered easy to remember.

At step 54, a selection is made between the prices determined at steps 50 and 52 to establish whichever is the higher. At step 56, a duration algorithm is applied which 30 effectively multiplies the price already arrived at by a factor to take account of the duration for which it is desired to register that numeric suffix (i.e. the period of hire).

At step 58, the price determined for the suffix being registered is returned to the user. At step 60, the user may interact via the internet with the remote database server 8 to accept or

refuse the price proposed. If the price is accepted, then processing proceeds to step 62 at which payment may be made (such as via a credit card), the primary address to be associated that suffix entered by the user and the mapping between the numeric suffix and the primary address established within the remote database server 8.

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Figure 5 schematically illustrates the relationship that may be established between the length of a numeric suffix and its price. As will be seen, generally speaking as the numeric suffix becomes longer, the price to be associated with it becomes shorter. For at least a portion 64, the relationship between length and price is one in which the price is inversely proportional to the length. It will be seen that the highest prices may be associated with not necessarily the shortest numeric suffixes. Three letter numeric suffixes may be readily remembered by users and are accordingly desirable to people wishing to register those suffixes. The price associated with these three letter suffixes will accordingly be high.

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Figure 6 schematically illustrates how a relevance algorithm which seeks to establish a price for numeric suffixes that takes account of any predetermined user relevance of that suffix. More particularly, the remote database server operator can establish a list of numeric suffixes that they consider have an above average pre-existing user relevance and associate corresponding prices with them. As previously mentioned, certain famous numbers and readily remembered numbers may have associated higher prices. The remote database server 8 may check a suffix which is requested to be registered against this list to see whether or not it is one with a special price associated with it.

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Figure 7 is a flow diagram illustrating how the price may be adjusted in dependence upon the duration of use. At step 66, the duration of use as entered by the person seeking to register the number at step 42 of Figure 4 is calculated as a number of years value D. The price already selected as the higher between that calculated in accordance with the principles described in Figures 5 and 6 is then multiplied by this duration factor D to determine a final price. This simple relationship would mean that it would cost twice as much to register a particular numeric suffix for two years rather than for one year. This duration algorithm might be adjusted to provide discounts for longer periods of registration, a set fee for permanent registration and a minimum fee.

Figure 8 schematically illustrates a computer 70 of the type that may be used to implement this invention. In this case, the computer 70 is part of a mobile telephone. The computer 70 includes a central processing unit 72, a non-volatile storage unit 74, a volatile storage unit 76, a display driver 78 and display 80, a user input/output unit 82 and a numeric keypad 84, a network link unit 86 and a common bus 88. In operation, the central processing unit 72 executes computer program instructions stored within one or more of the non-volatile storage units 74 and the volatile storage unit 76 to perform the data processing operations discussed above. It will be appreciated that certain of the data processing operations are performed in the computer device used by the user seeking to access the remote data object whilst other of the operations are performed within the remote database server 8 or by the web server 6. Similar sorts of computer may be used to execute program instructions to perform these other functions. The computer programs executed effectively provide computer program code routines that correspond to different functions of the described technique. The controlling computer programs may be distributed via conventional computer program media such as floppy disks or compact disks, or may be dynamically downloaded via the network link unit 86.

Another way of viewing the present invention is described in the following pages:

20 These systems concern the field of addressing the World Wide Web (WWW) & the Internet. Generally World Wide Web addresses are constructed of character sequences known as URLs that define a complete path to a particular resource. The format of this address is defined in standard texts, but functionally it includes a protocol, a server and a resource path on that server. The systems described herein (named "Bango") provides an alternative 25 addressing format that is superimposed on the underlying WWW address structure and a number of related features.

URLs provide a convenient and extendable form for addressing within Web browsers and typically mimic the structure of the underlying storage of web pages. However there are 30 many circumstances where they are both cumbersome to use and hard (or impossible) to use.

Additionally, although the address space available to be described by URLs is effectively infinite, the root (or server) component of URLs is becoming increasingly congested as companies and individuals register (reserve) most standard forms.

Currently, the use of universal resource locators is based on alphanumeric sequences of letters, and most often as known words. Confusion persists over spellings and the syntax of word combinations as users try to accurately input standard web addresses. Words do not 5 work as well as numbers across multiple languages and may be easily mispronounced and mis-transcribed. Lately, the pool of available words for the registration of web addresses has diminished to almost nothing.

Increased use of dynamic web pages encourages the formation of complex, machine 10 generated URLs. It is extremely hard to communicate these in printed or oral form, and transcription errors are frequent.

The use of numbers (instead of strings) provide a range of features of convenience for 15 internet users. Numbers are often more memorable than names, less prone to mispronunciation and more standardised across multiple languages than words. There is currently no global service for allocating numbers to web locations.

“Bango” addressing has been invented in order to provide a standard alternative format 20 for us on the WWW that avoids the issues described above.

With the proliferation of internet access devices that use numerical keypads, words are an inconvenient, time-consuming and error-prone method by which to link to the internet. Telephone and TV controllers use numeric pads as their primary interfaces and are thus somewhat disadvantaged for web access. Bango addressing enables such devices to use their 25 standard interfaces to address web resources.

A number of alternative WWW schemes have been implemented. Examples of these include “Real Names” and AOL keywords. However neither of these schemes provides the capabilities that Bango provides

30 As has been outlined above, WWW addressing is both congested and potentially cumbersome. Although standard computers have historically been the primary interface for WWW users the arrival of web capable telephones, televisions and other devices without standard alphanumeric keypads makes the URL an inconvenient format. Bango addressing

provides an ideal solution to these needs. Additionally URLs are cumbersome to transcript between print format and the input to WWW device.

Bango addressing provides a solution the above need, by defining a "Bango" number
5 and the linkage and management of this number to one or more URLs. The Bango number
enables a browser user or WWW capable device to simply enter a numeric sequence of
numeric digits in order to be able to navigate to a specific WWW address. Additionally a
Bango number is easy to identify in print format and extremely easy to enter into a WWW
device at a later stage.

10

Bango numbers provide a precise, easily communicated, shorthand for web addresses.
Many newspapers and magazines now print 100s of URLs each day but are cumbersome and
error prone. Replacing these URLs with simple Bango numbers provides a vast improvement
for users.

15

A key element of the system is the Bango number itself and the mapping of this number
to a target URL.

20

The Bango number consists of one or more numeric digits (0-9) forming a numeric
string (the string may also be prefixed by a special delimiter as described below).

A Bango server holds a directory whereby a unique Bango number is transparently
mapped (from the users perspective) to a target WWW page via a simple redirection process.

25

The Bango server can select between multiple URLs dependent upon the requesting
device or secondary attributes (such as date, day of the week, source domain etc.).

30

A bango number may be entered directly into a web browser via a URL of the format
www.bango.net/NNNN where NNNN represent a Bango number or via usage of a shortcut
form using an "escape" prefix in the form !NNNN, where "!" (or another non-numeric
character) identify that the following string represents a Bango number. Similarly a Bango
number may be directly entered into any WWW device that only has the ability to enter
numeric data (in a form such as #NNNN).

Additionally existing telephone and fax numbers can be used as numbers to address internet resources. This enables the vast telecommunications addressing infrastructure to be used in parallel to access internet locations.

5 Bango numbers may be allocated in a number of ways. A standard "user registration" process may be used:

1. The user logs onto a web site to search for the availability of a number.
2. The Bango.net computers host a directory service which holds all registered numbers.
- 10 3. Searching for any number already registered will cause a message to be returned to the user indicating that the number is already registered and therefore unavailable.
4. When one or more available numbers have been identified, the user proceeds through a registration process.
- 15 5. The registration process requires that the user enters certain personal details to establish a registered user record in the Bango.net database.
6. For new users, a password is provided once registration is complete, which they use for subsequent accesses to the web service.
7. The user is prompted to then enter the universal resource locator for a given web page (or other object), which the user wants to number to point to. (Alternatively, if the user does not have their own storage space elsewhere, they may at this stage enter the content to which they wish the number to link with this content being stored on the Bango.net server.)
- 20 8. This URL is then stored in the Bango.net database and linked to that number.
9. There is a payment mechanism which enables the user to submit license fees for the service on-line.
- 25 10. Users can enter the site at any time, and access to Bango.net service by identifying themselves on-line, in order to modify their number links or to register and license further numbers.

URLs consist of a string of characters that embodies two elements, the server and the reference within that server. This reference may itself contain parameters and other fields. A Bango number provides a single identifier that encapsulates this compound set of information to allow simple referral to this compound information. The structure also
5 enables the URL to be dynamically changed.

No other addressing schemes provide this unique combination of dynamic address resolution to a compound target address structure.

10 World Wide Web addressing is a key element of the success of the web. However, to date addressing structures have been suited to use within html pages and for dynamic (programmatic) generation. URL addressing is generally believed to be an inviolate attribute of web usage and it is counter non intuitive to consider overriding this fundamental element of the web.

15
Mapping from Bango number to URL (see Figure 9)
Notes: 1) User enters !911 => Bango server
2) Bango look up directs to
<http://www.us.porsche.com/english/911/models/default.htm>
20 3) Page is displayed normally
4) Session continues directly between browser and Web Server

25 Bango addressing provides a solution the above described needs, by defining a "Bango" number and the linkage and management of this number to one or more URLs. The Bango number enables a browser user or WWW capable device to simply enter a numeric sequence of numeric digits in order to be able to navigate to a specific WWW address.

30 Web addressing is dependent upon registration of web server addresses. Standard fees are normally charged to register a specific web server name within a suffix (com, net, org, co.uk etc.) for a finite period.

The feature now described relates to the manner in which Bango addresses are registered and fees charged for their usage

The total "space" of Bango numbers consists of the space of finite integers with length attributes, with time dependence (that is a Bango number may be purchased for a finite period).

5 This feature defines the manner in which Bango numbers are charged for.

A Bango number has the following primary chargeable attributes:-

- a) Length
- b) Lifetime
- c) Market value/relevance

10

A pricing algorithm is used to automatically determine the price for a Bango number. This algorithm has the following basic attributes.

- a) Price is inversely proportional to length (non-linear)
- b) Price is proportional to lifetime
- c) A relevance factor may increase or decrease the price for a specific number (e.g. 911 is more valuable than 191)

20 Additionally specific ranges of numbers may be provided free of charge or under varying pricing rules. Thus a potential customer can select a Bango number based on their specific needs.

The pricing process used for Bango numbers is different from that used for any known product or service. Key differences are that:

- a) Pricing is non linear
- b) Pricing is based on a period of ownership
- c) High value/high relevance numbers are treated as special

30 In order to map a Bango address to a URL a Bango directory is used. This directory is accessed automatically via the URL www.bango.net/N where N represents the Bango number concerned. The technique used for mapping Bango numbers to URLs is described below.

Web addressing is based on a distributed network of name resolvers that locate the server on which a specific URL resides. The Bango directory defines a numeric addressing

structure that is resolved independently of the Web DNS structure and is superimposed on the underlying TCP/IP addressing mechanisms.

5 In order to minimize resolution delays the Bango server holds an in memory cache that may be preloaded with resolved IP addresses. During idle time the Bango server seeks to pre-resolve server names to expedite URL retrieval. Additionally a cache of most recently accessed Bango numbers may be used. Bango servers can also be replicated to improve performance.

10 Bango browser plug ins may also be used to provide a distributed cache, whereby the browser may hold recent Bango number mappings and, via interaction with the Bango Server, cache coherence can be achieved.

15 Effectively Bango mapping uses a distributed hierarchy with cache coherence. The Bango server can further pre-resolve DNS lookups and redirections and, through the use of browser plug-ins can make the browser an active part of this hierarchy.

20 Many cache schemes are used today to reduce transmission latency and avoid unnecessary network traffic. However, the scheme used by Bango integrates a number of cache techniques into a combination that differs from known existing schemes.

Mapping from Bango number to URL (See Figure 9)

Notes:

1) User enters 1911 => Bango server
25 2) Bango server uses indexing mechanism to look up URL via cached database and directs to
<http://www.us.porsche.com/english/911/models/default.htm>
3) Page is displayed normally
4) Session continues directly between browser and Web Server

30 If the browser cache includes a pre-resolved mapping all phases are skipped and browser goes directly to target URL. Typically this will also remove the need for the DNS lookup and the URL request would be dispatched directly to the IP address (32.97.104.162).